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ON

PATENCY OF THE FORAMEN OVALE,

ATTENDED WITH

CYANOSIS

AND A

FAINT MURMUR

SYNCHRONOUS WITH

THE FIRST SOUND OF THE HEART.

[illegible]

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BY

B. W. FOSTER, M.D.,

ASSISTANT PHYSICIAN TO, AND DEMONSTRATOR OF PATHOLOGY IN, THE QUEEN'S HOSPITAL;
LECTURER ON PRACTICAL ANATOMY IN QUEEN'S COLLEGE, BIRMINGHAM.

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ON PATENCY
OF THE
FORAMEN OVALE, ETC.,

EARLY in October last, when seeing my out-patients at the Queen's Hospital, my attention was attracted by two children—a boy and a girl, aged respectively three and two-third years and two years. These children at once forced themselves into observation by the blue duskiness of their faces, the purple colour of their lips, and their heavy, unintelligent expression. On closer examination they were found to be affected in different degrees. The boy, darker in colour, and more stupid in appearance, seemed to take no interest in surrounding objects; he was unable to walk, and had never made efforts at speech. The girl, on the other hand, paler in colour generally, but with equal blueness of the lips, evinced occasional interest in passing objects; and when irritated showed more decided signs of anger; she could walk a little, and sometimes made attempts to speak.

The surface in each was of a dull blue colour, much darker on the fingers and toes, which were, however, *well-formed.* The lips were of a dark purple hue, and the mucous membrane of the mouth equally discoloured. The pupils were dilated and sluggish, the conjunctivæ bluish, with the vessels of the sclerotic large, numerous, and purple. The skin was smooth and soft, but dry, and very cold, especially on the extremities. The tongues were clean, the appetite said to be good, thirst sometimes marked, the bowels usually slightly relaxed, but very much so at present. The stools generally very dark in colour. Micturition not frequent. Urine and feces very often passed in bed.

The thorax of the boy (Cornelius H.), on inspection, presented a remarkably rounded appearance at the upper part, towards the left side, causing his chest to look somewhat barrel-shaped. His breathing was laboured, and attended with very marked action of the diaphragm. Respirations 38 per minute. Resonance on percussion all over front of chest; slight dullness behind at the bases of the lungs. On auscultation, sibilant and mucous rales were heard pretty generally all over the front and back of chest, but more marked posteriorly. The heart's action, though quick, seemed regular; apex beating between fifth and sixth ribs. The area of cardiac dulness was slightly increased towards the right side. On auscultation, a murmur was heard with the first sound, varying in intensity at different times, and in different positions of the patient. Heard loudest between third and fouth ribs of left side, at their junction with the sternum; most distinctly with the patient placed in the sitting posture, or leaning forwards. The sound was heard as high as the upper margin of the third rib, but was not heard at the apex. Second sound healthy. Pulse 96, weak and small.

The abdomen was found to be tympanitic. The liver was enlarged, could be felt half-an-inch to one inch below the ribs, and stretched across the epigastric region. No perceptible increase of splenic dulness.

In the little girl (Mary Ann H.) the chest was very fairly formed, with only a very slight increase of roundness in the upper part. The breathing, though much more laboured than natural, was easier than in the other case. Percussion sounds resonant all over the lungs, with the exception of the most posterior and inferior portions. Sibilant and mucous rales were heard over front and back of chest. There was no perceptible increase in cardiac dulness. On listening to the sounds of the heart, a faint murmur was heard with the latter part of the first sound, on a level with the lower edge of the third rib, at its junction with the sternum. This murmur varied in intensity, and occasionally gave rather the idea of a muffling of the first sound. It did not extend upwards, and was not to be heard at the apex. When the patient was placed on her left side, or leaning forwards, it was more distinct. The second sound was normal. Action of the heart regular; pulse, 110—small and weak. The abdomen was slightly distended with air. The area of hepatic dulness was increased, extending about one inch lower than natural, and considerably towards the left side. No enlargement of the spleen could be detected.

The mother informed me that the children were both much discoloured at birth; the cyanosis was then, however, more marked in the little girl. They are very liable to paroxysms of passion, during which they become much darker in colour, and their breathing more laboured. They have had occasionally attacks of palpitation and difficult breathing, unconnected with passion. During sleep they often have convulsive twitchings of the limbs. They generally have a cough, and expectorate watery mucus. They are always cold; and, although they have had no particular illness, they have always been low, weakly, and as bad as at present.

The mother's history I found to be as follows:—She was always healthy until a few months before marriage, when she had a bad attack of rheumatic fever; which, from her account, seems to have affected her heart; there is, however, at present no trace of disease in the heart, which I have examined carefully. She married, when 20 years old, her first cousin, then aged 19 years. . He has been always healthy and steady. I found no trace of syphilis in his history, nor any signs of disease of the heart. During her first pregnancy she suffered much from palpitation and pain in her left side. She carried the child only eight months; on birth it presented marks of cyanosis, and lived only eight months. Her second pregnancy was attended by no cardiac symptoms, and the child, born healthy, is still alive and well. The third child was born with marked blueness of the lips and surface, after a gestation attended with pain in the side, &c. It lived 21 months. The fourth child was born healthy, and is still alive. No cardiac symptoms attended this pregnancy.

The fifth, sixth, and seventh children, at birth, all presented symptoms of marked cyanosis; and these pregnancies were all attended by the heart symptoms. The fifth child lived for six years, but never walked or talked. The blueness of his surface continued, and became more marked towards his end. The cases of the sixth and seventh children have just been related.

The children having been brought on account of the looseness of their bowels, were first treated for this by chalk mixture. This soon remedied it; and the bronchitic symptoms were relieved by a little expectorant mixture. I ordered them also such warm clothing as the mother could procure for them, with nourishing diet, &c. On their third visit I prescribed for them cod-liver oil, with the view (as laid down in books[a]) of increasing their animal heat. Accordingly I made observations of the temperature of different parts of their bodies, and found that, in the case of Cornelius H., the fingers were seldom more than 5° to 8°, the toes 1° to 3° higher than the temperature of the room in which he was placed. In the little girl, the fingers varied from 6° to 9°, the toes from 2° to 4° higher than the surrounding atmosphere. For instance, in a room heated to 58°, I found, from the average of three observations on different days, that the fingers were, in the boy—66°, the toes 61°; in the girl—the fingers 67°, the toes 62°. In the mouth the temperature averaged—in the boy, 96°, and in the girl, 97½°. In the boy it once fell so low as 90°, while the lowest observation in the girl was 92°.

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[a] *Vide* Walshe on Diseases of Heart and Lungs.

The treatment with cod-liver oil I found did not benefit the children by producing any marked increase of the temperature of the surface, which on one or two occasions rose 2° on an average in the boy, and 3° in the girl; but at other observations fell to its usual standard. I therefore determined to try another plan of treatment, and I ordered the children four-grain and three-grain doses respectively of the chlorate of potash. This drug I prescribed with the view of oxidizing the blood, by means of the oxygen set free by the decomposition of the salt. When I next saw them their colour was much improved, and their temperature had risen from 5° to 6°. I continued this treatment, giving drachm doses of cod-liver oil in addition, for some two or three weeks with marked benefit. At this period, however, I unfortunately lost sight of the children for some two months; and on their re-appearance I learned that they had been for some time in the workhouse, and had only just been discharged. The privations that the children had undergone previous to the time that they had entered the workhouse had materially weakened them; and even now the extreme poverty of the parents rendered the supply of the bare necessaries of life often precarious. In March I determined to try the effects of the new therapeutic agent, peroxide of hydrogen; but as I gave it at first in only small doses—viz., two minims to the younger and four to the elder, I found it not much improvement on the chlorate of potash. I have, however, since given it to the boy in eight-minim doses, three times a-day, with marked benefit. Under this treatment (although the disease has evidently progressed in some respects since he was first presented at the hospital, owing to the unfavourable hygienic conditions in which he has been placed) a marked improvement in his colour has occurred: his breathing has become less laboured, and the temperature has risen very considerably, and has reached, in the upper extremities, almost its natural standard; in the toes the increase is not so great, but is nevertheless considerable,

While I was out of town for some short time in April, the little girl died; and, in my absence, Mr. Thomas Thompson, one of the resident medical officers of the Queen's Hospital, kindly made a *post mortem* examination for me. It appears that for some few days before her death, the child laboured under a sharp attack of congestive bronchitis, and her colour became much worse. Slight jaundice came on some 48 hours before her death. This, in addition to the cyanosis, caused great discolouration of the surface, making it, as the mother expressed it, "all colours in turn."

On the 22nd of April, the day after her death, Mr. Thompson made the *post mortem* examination.

The surface of the body was livid, but not so dark as it had been during life. Body rather emaciated; no œdema of the lower extremities. The lungs were found to be much congested, and frothy fluid exuded freely when they were cut into. No tubercle was found; the mucous membrane of the bronchi was red and congested. The pleuræ contained in their cavity some few ounces of serous fluid on each side. The pericardium, when opened, was found to contain one ounce and a-half of serous fluid. The heart was normal in appearance and size. Large fibrinous clots were found in the right cavities adherent to the walls. No hypertrophy of the ventricles. Right auricle, if anything, slightly thickened. Left auricle normal. No trace of any disease of the tricuspid, mitral, or semilunar valves was detected by the most careful scrutiny. The orifices of the aorta and pulmonary artery were not to the slightest degree narrowed. The only abnormalities, in short, which could be detected were patency of the foramen ovale, and a rather large-sized Eustachian valve. The communication between the auricles was small, admitting only a large-sized goose-quill; it was due to the want of development in the valve of the foramen ovale. This valve, attached above and below in the left auricle, was deficient in front, leaving an opening of the size mentioned, when the septum of the auricles was in its natural position. Pressure on the valve from the left auricle decreased the aperture of communication, while similar pressure on the right side increased it. The Eustachian valve presented nothing worthy remark beyond its large size. The ductus arteriosus was closed. Abdomen.—Some little serous effusion was found in the cavity. The stomach was pushed towards the left side by the liver, which was considerably enlarged, and of a pale yellowish colour—in spots almost yellowish green. It did not appear fatty; no microscopical examination was made. The spleen, normal in structure, was not enlarged. The other viscera were healthy. The head was not examined.

An attentive perusal of the history of these two children, and a careful consideration of the *post mortem* appearance discovered in the little girl will, I think, suggest to the mind several points of much interest. The most notable of these I propose to consider briefly under the following heads:—

1. *The symptoms presented by the integumentary system (general symptoms).*
    - (*a*). The discolouration of the surface.
    - (*b*). The temperature of the general surface.

2. *The physical signs found on examining the heart's sounds during life, and the post mortem appearances observed in the case of the younger.*

3. *The conditions presented in each by the nervous system.*

4. *The treatment.*

5 *The antecedent history of the children and of the parents.*

1. (*a*). Discolouration of the surface of the body, such as existed in these cases, and even to a more intense degree, has been observed to occur in many cases without the existence of any lesion admitting of admixture of the arterial and venous blood. Patency of the foramen ovale, and other free communications between the right and left cavities of the heart, have also been recorded in which no blueness of the skin was present. Marked cyanosis has, on the other hand, been frequently observed in cases where the only morbid condition found after death has been either constriction of the orifice of the pulmonary artery, or some other lesion causing great congestion of the venous system.

Armed with these facts, many authors, headed by Morgagni, Louis, Ferrus, and more lately by Dr, Stillè, argue that cyanosis depends, not on the mixture of the venous with the arterial blood, but solely on venous stasis, produced by contraction of the orifice of the pulmonary artery, or other lesion producing similar effects. Other authors[a], and with these I am disposed to agree, attribute the discolouration partly to the admixture of the venous and arterial blood, and partly to the congestion of the right cavities of the heart and the systemic venous system, which is the consequence of the lesion permitting the mixture. They at the same time admit that contraction of the orifice of the pulmonary artery, and like causes are, when very marked, to some extent capable of producing general cyanosis.

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[a] Gintrac, Hope, Walshe—Diseases of Heart and Lungs, 2nd Edition, 1854; Speer, Medical Times and Gazette, 1855, p. 412.

The intensity of the discolouration is also much greater, as pointed out by Dr. Cheevers, in cases in which the venous congestion has existed since birth, or from a tender age, on account of the probable greater dilatability and capacity of the vessels in early life. The condition of the skin has also a considerable share in modifying the intensity of the colour. In all cases, I believe, where marked cyanosis exists, the skin is generally thin and dry, and the cutaneous exhalation almost, if not entirely, lost. Now, when we consider that a large amount of carbonic acid, and carbon in other forms, is constantly being given off by the skin in health, and that the stoppage of this respiratory function of the surface has been found in animals to produce asphyxia, we can well understand the important part played in the aggravation of the cyanosis by the arrest of this exhalation.

The thinness of the skin also allows the dark blood filling its capillaries to be more apparent.

In applying these facts to the cases before us, we find, I think, that the view which attributes the cyanosis to the admixture of the blood, as well as to the venous stasis, is more consonant with the phenomena observed. In the little girl there was certainly no condition found in the heart, except the patency of the foramen ovale, to produce the lividity of the surface. This lesion, I consider, by permitting the passage of the blood from the right auricle into the left, not only caused the mixture of the blood, but also produced more or less obstruction to the return of the blood from the lungs into the left auricle, and thus caused, secondarily, congestion of the lungs, of the right cavities of the heart, and of the general systemic venous system. The part played by the congestion of the lungs in both these cases was well illustrated by the fact that any increase of this condition was always accompanied by greater discolouration of the surface. It has been observed, also, that as long as a full proportion of blood be circulated through the lungs, although this red blood be afterwards mixed with an equal quantity of black blood in the heart, yet no great discolouration of the skin occurs; but the moment any congestion of the lungs arises to disturb these proportions we have, more or less, marked cyanosis. The condition of the heart in the little boy I am inclined to consider similar to that found in the little girl, with, however, a larger aperture of communication between the auricles.

The state of the skin in both cases has been spoken of as thin and dry—so dry that the mother says the children have seldom, if ever, perspired. This dryness of the surface, although, probably to some extent dependent on the circulation of venous blood in the cutaneous vessels, nevertheless, I think, by stopping the exhalation of the hydro-carbons and carbonic acid through the skin, reacted on its cause, and materially increased the evil. The thinness and transparency of the skin, too, allowed the large and numerous capillaries to be more easily seen.

(*b*). The temperature of the surface of the body is always found to be considerably lessened in cases where the blood circulates in a venous condition. This we can readily explain by the fact that between the imperfectly oxidized blood and the surrounding textures those chemical changes cannot take place which require for their production blood containing a large proportion of oxygen, and which result in the formation of animal heat. Naturally, then, in cyanosis, where this condition especially obtains, we expect to find the temperature of the surface of the body considerably lower than in health. Hence we find, in the cases before us, a marked want of warmth on the surface. When investigated, the temperature of the fingers in the boy was often found as low as 64°, and the toes 59°, in a room where the thermometer stood at 58°. The palms of the hands and lower part of the fore-arm never showed a higher temperature in the boy than 70°; and on one occasion the temperature in his mouth fell to 90°. The observations in the little girl accorded well with those in the boy; her surface, however, as might be expected from the less marked cyanosis, being generally a degree or two higher We have in cholera, under somewhat similar circumstances (viz., the circulation of imperfectly arterialized blood, and the almost complete arrest of the chemical changes accompanying the disintegration of the tissues), the temperature as low as 70°, and sometimes even lower. I cannot, however, recall at present any cases of cyanosis in which the temperature was so low as in the case of Cornelius H. This remarkable deficiency of the power of forming animal heat in these cases is to be accounted for by the conditions under which they laboured, viz.:—

1st. The circulation of insufficiently oxidized blood through all the systemic vessels.

2nd. The arrest of the respiratory functions of the skin.

3rd. The mal-nutrition of the children depending on the deficiency of the supply of nutritive food.

The two former of these conditions were the more marked in Cornelius, in whom the temperature was the lower.

2. In remarking upon the physical signs found on examining the sounds of the heart in these cases during life, our attention is arrested by the character, the position, and the variability of the murmur as heard in each. In the boy, the bruit heard synchronous with the first sound was fairly distinct. It was audible chiefly with the latter half of the sound, and was heard loudest over the base of the heart, but was not heard either along the course of the aorta or pulmonary artery. During the whole period of treatment it has always borne a direct proportion to the congestion of the lungs, and to the discolouration of the surface; and since, under the treatment, the circulation through the lungs has been more free, the murmur has become much fainter. In the little girl the bruit was never heard with the same distinctness as in the boy, but gave rather the idea of a muffling and slight prolongation of the first sound; but was always louder in proportion to the pulmonary congestion; and when this condition was least the murmur was inaudible. Its position corresponded with the base of the heart. In my clinical observations to my class, after I had observed the cases for some time, I attributed the production of these murmurs to patency of the foramen ovale. This opinion I also put forward in a paper read before the branch of the British Medical Association here. I was led to this diagnosis by the want of any evidence of the hypertrophy of the right ventricle, by the fact of the murmur not being traceable along the great vessels, and by the faintness and by the occasional absence of the bruit, all of which conditions I conceived to be more or less incompatible with any constriction of the orifice of the pulmonary artery, the usual source of murmurs in these cases. Deficiency in the septum of the ventricles would, I considered, have caused the blood to flow from the left to the right cavity, on account of the greater power of the left ventricle; and any other considerable malformation of the heart would, I presumed, have caused much greater irregularity in its action. My views, as thus expressed, were singularly confirmed on examining the heart of the little girl after death. Most carefully have I, on several occasions, investigated the condition of all the valves and apertures, with the constant result of finding no other abnormal condition to account for the murmur but the patency of the foramen ovale. The perusal of Dr. Markham's case (*vide Med. Times and Gazette*, April 4, 1857), which presented, in the condition of the foramen ovale, some

resemblance to the state found in the heart of the little girl, confirms me in the opinion that the modification of the first sound in her case was caused by a murmur generated at the patent foramen. Let us consider briefly the conditions in this case favouring the production of such a murmur. We have a valve stretching across the foramen, and attached above and below in the left auricle, leaving an aperture, elliptical in shape, between its margin and the circumference of the opening. This aperture would be increased by any pressure from the right side, and proportionally decreased by a similar condition in the left auricle; the current of any flow of blood, therefore, would be rather from the right to the left cavity. The unusually developed condition of the Eustachian valve in this case, would, I conceive, direct the current of the blood from the inferior vena cava towards the foramen ovale, and this flow, impinging upon the body of the valve, would increase the aperture, and cause the valve to assume that tense condition in which vibrations of its margin would be produced by the passage of the blood from the right to the left auricle. Any congestion of the right cavities would also strengthen this condition by dilating the opening still more, and thus favouring the increase in intensity of the murmur by the flow of a stronger current of blood over the vibratile valve, while the opposite condition of the right cavities would diminish it. The occurrence of the murmur, too, during the diastole of the auricles, and, therefore, synchronously with the systole of the ventricles, supports this view, as pointed out by Dr. Markham. From these considerations, and also from the fact that repeated and careful examinations of the heart disclosed no other morbid condition capable of producing the bruit, I am constrained to agree with Dr. Markham in supposing that patency of the foramen ovale can, under certain conditions, produce a murmur with the first sound. One of the conditions present in this case, and on which I am inclined to lay some stress, being the existence of a well-developed Eustachian valve, by which the current is directed towards the patent foramen; the other, as pointed out in Dr. Markham's paper, being the existence of a valve connected with the inter-auricular opening, which, by its tension and vibrations, generates the sound as the stream passes over its margin.

The condition of the liver, as found on *post mortem* examination, is, I consider, worthy of remark, as showing the efforts made by this viscus to supplementalize the action of the lungs. In all the lower animals a pretty constant relation exists between the activity of the lung functions and the size of the liver. Wherever the lungs are weak, and fail to decarbonize the blood, we find a proportionate increase in the size and activity of the liver. In this case, from the defect of the heart's formation, and in consequence of this, from the inability of the lungs to perform their duty thoroughly, we have, through the circulation of venous blood in the systemic vessels, an increased amount of decarbonization to be effected by the liver, and therefore the hypertrophy. The yellowish-green colour of the organ was due, I think, to its activity, and reminded me of the peculiar colour, described by Weber, as seen in the livers of frogs during the season of their greatest activity. The dark colour of the stools, and the occasional diarrhea to which the children were subject, were due, I believe, to the large secretion of bile; and the jaundice observed in the little girl, before death, was owing to the arrest of this secretion from the failure of the liver to respond to the extra call made upon it during the bronchitic attack.

3. The symptoms presented by the nervous system in cases of cyanosis are not often so well marked as in these cases, according to many observers; some authors,[a] indeed, go so far as to assert that there is usually no impairment of the intellect. In the cases before us, the dull and stupid expression of the countenances of the children was remarkable, and the diminished intelligence was found to be much greater in the case of the elder, in whom the cyanosis was the more intense; while in the little girl, whose colour was never so bad, the intellectual development was much higher. All the children thus born (*i.e.*, cyanotic) were, according to the mother, very stupid; and the one who lived to be six years old never spoke or walked. From what we know of the effects produced by the circulation of venous blood through the brain, the want of intelligence, as exhibited by these children, does not appear unaccountable. Sir Benjamin Brodie, in his *Psychological Inquiries*,[b] says, when speaking of the circulation of venous blood in the brain:—"The dark-coloured blood, if it has once been transmitted to the brain, even for two or three minutes, leaves an impression on it, from which it may not recover for half an hour, or even longer." And again, in the next sentence but one, he says:—"In fact, the dark-coloured blood transmitted to the brain operates as a narcotic poison." This recalls to our mind the fact, that Dr. Snow laid down the great law that narcotism is but suspended oxidation. It is, from these considerations, natural to suppose that the constant circulation of blood, deficient in oxygen, through the brain, must

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[a] *Vide* Fuller on Diseases of the Chest, article "Cyanosis."

[b] Page 122, Second Edition. 1855.

materially affect the intellectual development. In a case, however, published by Dr. Richardson (*vide Medical Times and Gazette*, December 22, 1860), the intellect was remarkably clear. From a perusal of this case, I am rather led to think that the mental clearness was due to the fact that there had been no great interference, during the greater part of life, with the functions of the lungs, and that, therefore, the exhalation of carbonic acid and the absorption of oxygen took place freely. When these conditions are not fulfilled I believe that more or less disturbance of the intelligence will always result; and that in all cases of marked cyanosis the intellectual powers will always bear a strict proportion to the quantity of oxidized blood which reaches the brain. The irritability of the temper we may, I think, attribute, with justice, to the disturbance of the brain functions, consequent on the circulation of venous blood; and to the same cause, acting on the cerebro-spinal system, is to be placed, partly, the inability exhibited by the little boy to walk, and not solely to malnutrition of the muscles. The other symptom—viz., the twitchings of the muscles—which so often disturbed the sleep of these children, we may fairly attribute to the circulation of black blood through the muscles; muscular spasms being known to frequently occur under such conditions.

4. *The Treatment.*—In all systematic works which devote a chapter to this peculiar disease, the merely palliative character which the treatment is obliged to assume, on account of the incurable nature of the malformation, is justly noticed. But after the recommendation of such remedies as are likely to benefit the paroxysms of difficult breathing, palpitation, &c., we are told that the temperature of the surface must be kept up by warm clothing, friction, &c., and that of the body generally elevated by the free administration of nutritious food, " oil, fat, gum, and other aliments of respiration."[a] In the early treatment of these cases I followed the principles generally laid down, but failed to attain any satisfactory result with regard to the increase of the temperature of the surface. This is not, I think, to be wondered at. For I cannot see how any benefit is to be derived from the addition of carbonized materials to blood already laden with carbonic acid; and in a system where the congested state of the lungs, consequent on the malformation, prevents these organs (already overworked) from making any extra effort to obtain for the blood that amount of oxygen essential for the production of heat by the combustion of such carbonized food. Such treatment can afford no benefit; and unless we can at the same time guarantee

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[a] *Vide* Walshe, Diseases of Lungs and Heart, page 521. (Ed. 1851).

an equivalent increase of oxygen, the additional carbon only aggravates the evil. We cannot look to the lungs to absorb for us their extra quantity of oxygen from the air, and, therefore, I submit, we must either feed the body with this element, by affording to the lungs air containing a larger amount of oxygen than exists in the atmosphere, or supply it through the stomach, by the administration of such drugs as will afford, by their decomposition during digestion, free oxygen to the blood. To use a homely illustration—the smouldering embers in the fireplace of an ill ventilated room are soon extinguished by the free addition of fuel; but by the addition of fuel in small quantities, and the admission of a copious draught of air, the dying ashes are soon kindled into a genial blaze. I adopted the latter of the two alternatives pointed out, in my treatment of these children; and at first tried to fulfil the indication by the administration of chlorate of potash, hoping that by the decomposition of the salt its large proportion of oxygen would be absorbed by the blood. The success which attended the use of this drug was satisfactory; and I continued it for some time, during which period the colour improved, and the temperature rose several degrees. This success confirmed me in the opinion that this was the rational treatment, and induced me to substitute for the chlorate of potash a more powerful oxidizing agent, the peroxide of hydrogen, (HO_2), introduced by Dr. B. W. Richardson (of London). At first, as I gave this remedy in small doses, it acted little better than the chlorate; but from the moment that I gave it to the boy in fair doses, his appearance changed. The colour of the face, which was before very cyanotic, became but slightly darker than natural; and his cheeks assumed, in place of a violet blue colour, a dusky reddish hue. His eyes, that before were dull, heavy, and expressionless, cleared and brightened, and followed with evident interest the movements of a stranger, and at once fixed on attractive objects. His breathing, before laboured, became much easier; his appetite improved; and the twitchings of his muscles ceased. The skin, before always dry, became soft, and on the body frequently moist. And, above all, the temperature rose to be, on an average, in the fingers, 82°; in the toes, 73°; and, in the groin, 91°: on one occasion the fingers were 89°. All the observations were taken in rooms varying in temperature from 63° to 64°. And when the mother, from domestic causes, was prevented bringing the child to the hospital, and the administration of the remedies ceased, the child relapsed almost to its former condition. The drug is, however, now constantly given in eight minim doses, three times a day, with a drachm of cod-liver oil twice a day, with the best effects. The child has improved both physically and mentally. When I last saw him (June 6th) he was playing with some toys, in which he evidently took a lively interest. The cyanosis was scarcely perceptible, the only peculiarity striking the observer being a slight blueness of the lips. His mother told me that he had made attempts, of late, to speak; and he can now utter, with tolerable distinctness, two or three words. His stools are much better in colour. His appetite is good. The liver still continues enlarged and active. The paroxysms of passion still often recur; but his colour is, by no means, as dark during their continuance. The temperature of the surface still continues to average the same as stated above—the only parts ever feeling cold being the toes. The continuance of the administration of the remedy will, I think, be attended with still further improvement in the child's state, as the blood becomes more normal in its character and circulating through the different organs in a more oxidized state, enables them to perform their functions more naturally, and, therefore, more perfectly. The great success which has attended this treatment, and the retrogression in the child's state which marked its temporary cessation, are, I think, the best proofs I can offer of its physiological correctness. The peroxide of hydrogen will, I doubt not, prove a valuable addition to our list of Materia Medica. Its action in this case leads me to rank it as one of the best, if not the best, oxidizing agent we possess for internal administration; and I believe its use will be found to be attended with great benefit in all diseases marked by deficient oxidation.

5. The antecedent history of the children and of the parents affords many interesting and singular peculiarities. The more striking of these I will at present merely enumerate; but on some future occasion I trust to dwell on them more fully. They are:—

(*a*). The near relationship existing between the parents—first cousins.

(*b*). The rheumatic fever from which the mother suffered shortly before her marriage, and which probably slightly affected her heart.

(*c*). The want of any evidence of cardiac disease in either parent.

(*d*). The peculiar cardiac symptoms which attended the gestation of each cyanotic child.

(*e*). The number of children born with cyanosis—five out of seven.

(*f*). The production of two healthy children between the diseased ones—viz., the second and fourth—both still alive and free from all signs of malformation or disease of the heart.